# Appendix R-9
# Water Resource Technical Meeting Minutes
February 1, 2017 & March 1

**The Hills - Water Resource Technical Meeting**
**Meeting Minutes**

| | |
|---|---|
| *Prepared by:* | Charles J. Voorhis, CEP, AICP, NP&V |
| *With input from:* | A. Martin Petrovic, PhD, Cornell University |
| | Christopher Gobler, PhD, SBU SoMAS |
| | Paul Grosser, P.E., PhD, PWGC |
| | Robert Grover, GPI |
| *Prepared for:* | Town of Southampton |
| *Date of Meeting:* | February 1, 2017 |
| *Date Issued:* | March 19, 2017 |

A technical meeting was facilitated by Councilwoman Christine Scalera of Town of Southampton and held in the Town Council meeting room on February 1, 2017. The purpose of the meeting was to gather technical experts on the applicants team with Dr. Chris Gobler of Stony Brook University School of Marine and Atmospheric Sciences (SoMAS) and Dr. A. Martin Petrovic of Cornell University (technical consultant to the Town) to review groundwater impact analyses contained in the DEIS. The intent was to identify differences of opinions, and develop consensus on the modeling for groundwater impact analysis of The Hills project. Present were: Christine Scalera (only for initial introduction and identification of purpose), A. Martin Petrovic, Chris Gobler, Paul Grosser, Bob Grover and Chic Voorhis. The following summarizes the discussions at the meeting.

- C. Scalera outlined the purpose of the meeting as identified above.
- C. Gobler indicated it would be good to have a Town planning representative present.
- C. Scalera indicated that Martin Shea was asked but unable to attend and A.M. Petrovic represents the Town on technical matters for the groundwater review.
- A.M. Petrovic summarized his role in review of the project and background regarding earlier and continuing consulting work for the Town on Golf at the Bridge (The Bridge) and Sebonack Golf Course, further indicating that he is retained by the Town to review The Hills project. A.M. Petrovic has been a soil and turf grass scientist for 37 years.
- C. Gobler indicated that those credentials were ideal for evaluation of the golf course.
- After introductions, C. Voorhis outlined the scientific approach for The Hills analysis and overviewed the ongoing LINAP process, agency/institutional collaborators and models for regional and site specific groundwater nitrogen load analysis.
- C. Voorhis discussed collaborative efforts used for The Hills groundwater impact analysis including NP&V; P. Grosser, PWGC; R. Grover, GPI; Jeff Seeman; and, Stuart Cohen.
- There was discussion of the Nitrogen Load Model; C. Gobler indicated that data inputs were updated since prior studies were completed using that model and the model was vetted by EPA. R. Grover stressed that this is a regional model.
- There was agreement that all are mass-balance based and are dynamic in in that they are updated and referenced based on specific use and current scientific information.
- A.M. Petrovic commented on his experienced with monitoring Southampton golf courses both before and after development, noting that Sebonack has legacy nitrogen contamination from prior sources that result in a well consistently coming up with concentrations over 10 mg/l, further indicating that these concentrations have persisted as a result of past land use and that the monitoring system is highly effective detecting groundwater impacts. He further indicated that turf nitrogen leaching rates can vary from 0-90%; however, The Bridge and Sebonack were in the range of 5-10% turf nitrogen leaching rates, and that The Bridge is nearer 10%.
- A.M. Petrovic discussed golf course nitrogen in fertilizer application rates indicating that greens are in the range of 2.5 lbs/1000 SF or less and fairways may be slightly higher at 3-3.5 lbs/1000 SF and that roughs are not systematically fertilized; however, greens clippings are sometimes spread on them. Petrovic further indicated that application rates have reduced over time depending

on management practice and are often 40% of what is allowed on Southampton golf courses. More specifically, A.M. Petrovic indicated the following: the Bridge in 2015 applied 1645 lbs of N over 70 acres (0.54 lbs N/1000 SF) and in 2016 applied 2512 lbs of nitrogen (0.82 lbs N/1000 SF) or 84% of the allow maximum amount of 3,000 lbs per year

- C. Voorhis indicated that The Hills will use a maximum of 2.5 lbs/1000 SF for greens and tees and 1.0 lbs/1000 SF for rough strictly based on the site-specific ITHMP for the course.
- In comparison, "do-it-yourself" lawn care may result in rates from 1.4-4.0 lbs/1000 SF depending on how many applications of a typical product 4-step application process are completed; and that commercial lawn-care applications are in the 2.5-3.0 lbs/1000 SF range.
- C. Gobler indicated that he thought the residential application rate based on LINAP consensus was less than 2 lbs/1000 SF, further indicating that this is based on up-to-date, Long Island local information collected from multiple sources.
- C. Gobler also indicated that the golf course leaching rate used for the NLM is 20% for golf courses not 30% previously stated and not the 10% used in the DEIS; however, a 30% leaching rate is used for residential.
- C. Gobler further indicated that Ken Zegel, SCDHS is coordinating with CDM Smith, consultant regarding metadata analysis for LINAP and is best to speak with to exchange data.
- C. Gobler suggested using a 20% turf nitrogen leaching rate for golf courses to be conservative; there was discussion to use the best scientific information based on the Town consultant and relevant input. C. Gobler indicated that Suffolk County used data from The Bridge and Sebonack and independently and empirically determined the leaching rates to be 20%.
- C. Gobler indicated there is variability of nitrogen in the aquifer with respect to the irrigation/fertigation well, with concentrations of 5 mg/l in transect wells on each side of the well that had concentrations as high as 29 mg/l and the SCWA with concentrations in the 6-8 mg/l range, further stating that a withdrawal concentration of 15 mg/l used in the modeling may be optimistic.
- P. Grosser discussed the vertical profile well and indicated most of the flow to the well is horizontal and that a withdrawal of 20 million gallons per year is not a high rate and will not draw water from a large distance. P. Grosser indicated he would determine the radius which was later reported to be 215 feet.
- C. Voorhis and P. Grosser indicated that the use of 15 mg/l for the withdrawal concentration would be reviewed.
- P. Grosser indicated that fertigation is commonly used and pump-and-treat systems are a routine method to remediate groundwater contamination.
- C. Gobler indicated that it was not clear in the DEIS analyses how the fertigation would be applied and how uptake was accounted for, with questions as to whether application would occur during the winter, during rain events, etc.
- C. Voorhis clarified that the team included irrigation experts and pumping would occur April through October and application would be regulated to occur only at times for optimum uptake, in conjunction with the ITHMP outlined methods for fertilizer application. P. Grosser added that the fertigation well was one well of a two well system that would be blended, monitored and used when needed for optimum fertigation uptake.
- M. Petrovic indicated that he had studied fertigation using titration methods and that if soluble nitrogen is maintained down to 0.4 lbs/1000 SF, the leaching rate would be zero (0); further indicating that if fertigation is adjusted to account for optimum plant uptake, the leaching rate of 5-10% is realistic. Petrovic offered to provide a 60 page report reference indicating that wastewater irrigation is common, particularly in other parts of the country.
- C. Gobler stated the allowable clearing limit is 15%; C. Voorhis clarified that the Town and Pine Barrens Plan clearing limit is 28% of existing natural vegetation, but the Pine Barrens Plan limit on fertilizer dependent vegetation is 15%.

- C. Voorhis reviewed model results for various leaching rates between 10 and 20% for the Proposed Project analyses, including an option that the applicant plans to use for centralized wastewater treatment to below 10 mg/l effluent limitation.
- C. Gobler also recommended that the DEIS be examined for the leaching rate for farmland (40% recommended), fertilization rate of lawns (2 lb/1000 SF recommended), Existing Zoning alternative percentages of lawn and impervious, wastewater nitrogen from workers and guests, efficacy of fertigation in light of seasonal fertilization, episodic rainfall and continuous loading of nitrogen effluent. C. Gobler further indicated that the zone of contribution for the fertigation well be modeled over a decadal time scale.
- C. Voorhis and P. Grosser indicated they would review the model analyses and report back.
- R. Grover offered to reach out to set up another meeting so that results could be reviewed and consensus reached.

The meeting began at approximately 10:45 and ended at approximately 11:35.

# The Hills Water Resource Technical Meeting
## Meeting Minutes

| | |
|---|---|
| *Prepared by:* | Charles J. Voorhis, CEP, AICP, NP&V |
| *With input from:* | A. Martin Petrovic, PhD, Cornell University |
| | Robert White, AICP, AKRF |
| | Christopher Gobler, PhD, SBU SoMAS |
| | Paul Grosser, P.E., PhD, PWGC |
| | Robert Grover, GPI |
| *Prepared for:* | Town of Southampton |
| *Date of Meeting:* | March 17, 2017 |
| *Date Issued:* | April 18, 2017 |

A second technical meeting was facilitated by the Town of Southampton and held in the Town Attorney's Council meeting room on March 17, 2017. The purpose of the meeting was to gather technical experts on the applicants team with Dr. Chris Gobler of Stony Brook University School of Marine and Atmospheric Sciences (SoMAS), Dr. A. Martin Petrovic of Cornell University (technical consultant to the Town), and Bob White, AKRF (environmental consultant to the Town) to review groundwater impact analyses contained in the State Environmental Quality Review Act (SEQRA) Draft Environmental Impact Statement (EIS). The intent was to discuss assumptions, methodology and preliminary findings of the groundwater impact analysis and develop consensus on these items as well as identify any items for further discussion and resolution. Present were: A. Martin Petrovic and Bob White (phone participants), Chris Gobler, Paul Grosser, Bob Grover and Chic Voorhis. The following summarizes the discussions at the meeting.

C. Voorhis opened with a presentation **(Attachment A)** that provided focus on the outline and content for the meeting. The outline of the items discussed is provided below:

- I. Overview
  - A. Meeting Time Schedule
  - B. Mention of Prior Meeting Minutes
- II. Discussion of LINAP Assumptions
  - A. Nitrogen Sources
  - B. Leaching Rates
- III. Discussion of Site Specific Assumptions
  - A. Golf Course ITHMP
  - B. Town Experience
  - C. Fertigation/Technology/Concentration
  - D. STP Technology
- IV. Discussion of Methodology
  - A. Nitrogen Load Calculations
  - B. Updates
- V. Discussion of Preliminary Findings
  - A. On-Site
  - B. Off-Site
- VI. Summary/Consensus
- VII. Next Steps/Minutes

Item I., the Overview established a time frame for the meeting which would run from approximately 10:15 to 11:55 AM. The prior meeting minutes were discussed and A.M. Petrovic will provide minor comments to C. Voorhis pertaining regarding the February 1, 2017 meeting.[1] All others were in agreement of the content of those minutes.

[1] Comments were subsequently provided; the final minutes of the first meeting are dated March 19, 2017.

Item II. involved a discussion of the assumptions that are emerging from the Long Island Nitrogen Action Plan (LINAP). C. Voorhis identified the LINAP assumptions and referenced a conversation with the Program Director for the Regional Plan Association and LINAP staff member indicating that the LINAP research was public record and could be used and referenced for site specific nitrogen budget modeling where appropriate. The assumptions were reviewed, found to be consistent with Dr. Gobler's notes from his participation in LINAP and agreed to be used per the presentation as discussed further herein. There was recognition that the LINAP work has been evolving in recent months and since at least January the assumptions have LINAP member consensus and have become available as public record since the Town acceptance of the DEIS for The Hills at Southampton on October 11, 2016.

Item III.A. involved discussion of assumptions applicable to the site specific modeling for The Hills. C. Voorhis noted that in conversation with LINAP staff, it was recognized that regional analysis factors may be based on more general assumptions and historical information, and that if site specific management plan information is available, it may be more appropriate for use than the regional LINAP assumptions. This was discussed in relation to fertilizer (nitrogen application rates) and it was determined that the ITHMP parameters (i.e., 2.5 lbs/1000 SF for greens, tees and fairways and 1.0 lbs/1000 SF for rough) were appropriate for use in the modeling of The Hills. C. Voorhis noted that these rates were a "maximum" and through operational management, lower application rates would be pursued. More specifically, C. Voorhis noted that significantly lower applications were being used at Golf at the Bridge, and A.M. Petrovic confirmed that lower rates would be pursued and achieved, and are in fact in practice at other Town of Southampton golf courses.

Under Item III.A and B., turf leaching rates were discussed. C. Voorhis mentioned Suffolk County Department of Health Services (SCDHS) computations for turf leaching rates at Golf at the Bridge seemed high and identified potential issues (not accounting for background conditions and not using all appropriate wells) in the methods, which A.M. Petrovic confirmed and specifically noted that corrections in the calculations resulted in leaching rates of less than half the SCDHS projection or 11.68% for the Bridge and 10% for Sebonack.[2] A.M. Petrovic indicated that based on his computations and experience 10-12% leaching rates are most applicable and the 20% recommended by LINAP is double what he would expect and "very" conservative if used. The general consensus was to reference the 10% golf course turf leaching rate used in the DEIS based on site specific Southampton studies and A.M. Petrovic's findings, but also include calculations using the LINAP regional 20% golf course turf leaching rate for sensitivity analysis and conservatism. C. Gobler noted that some groundwater below Sebonack Golf Course had pristine nitrogen levels (0.1 mg/l) that rose to nearly 2 mg/l after the course was completed in 2012.

[2] Subsequent to the March 17, 2017 meeting, Dr. Petrovic further analyzed the SCDHS turf leaching rate of 20% as recommended for LINAP watershed studies and provided a written summary of his analysis. In an email dated March 27, 2017, Dr. Petrovic and attached the analysis included as **Attachment B** to this email finding that a leaching rate of 6.3% is more appropriate based on accurate input data, and included the following as a summary in the email transmittal: "Hi All, attached is my quick review of the golf course nitrogen leaching rate analysis done by SCDHS for LINAP. I cannot support their conclusion that 20% of the nitrogen fertilizer applied to golf courses will leach into groundwater just from taking a quick look at the data they used (and didn't use). In fact it is much less. I would be very glad to work with them to analyze the data we have from The Bridge and Sebonack to come up with a much more realistic value. Marty, A. Martin Petrovic, Ph.D., Professor Emeritus of Turfgrass Science."

Under Item III.C. the proposed fertigation system was discussed. P. Grosser discussed that the technology for groundwater pump and treat systems for contaminant remediation is common and achievable. R. Grover inquired about a recent meeting pertaining to cleanup of Georgica Pond in East Hampton, and C. Gobler indicated that he met with Friends of Georgica Pond and suggested groundwater pumping and treatment (potentially using wetland systems) as a possible technology for Georgica Pond water quality improvements, in part based on the ongoing discussions relating to The Hills. C. Voorhis noted that the Town included this technology as a remediation method in their Water Quality Improvement Project Plan (WQIPP).

Also under Item III.C., the concentration of nitrogen in the fertigation withdrawal well was discussed. C. Voorhis referenced 6-year nitrogen monitoring data for the Suffolk County Water Authority (SCWA) Spinney Road Well #2 that P. Grosser had received which averages 12.76 mg/l of total nitrogen. P. Grosser confirmed that this well is screened in the lower part of the Upper Glacial Aquifer and provided a date-concentration chart of the data. P. Grosser indicated pumpage rates in approximate ranges from 20 million gallons per day (MGD) to over 40 MGD, further indicating that the concentration was lower at high pumping rates (range of 8-10 mg/l) and higher during lower pumping rates (12-14 mg/l). C. Voorhis and P. Grosser indicated that a withdrawal concentration of 10-12 mg/l was supportable for modeling of the benefit of nitrogen removal from the aquifer. There was discussion of other transect and multi-depth samples collected by The Hills team on the south part of the subject site for identification of the "plume" of enriched nitrogen. Based on this information, C. Gobler indicated he does not believe that 10 mg/l is a scientifically sound assumption given the data available; however, consideration of the SCWA data was found to be compelling due to the longer period of record of the data and the high pumpage rates that would be similar to irrigation use for The Hills.

Also under Item III.C., the operation of the golf course fertigation system was discussed in as much detail as is appropriate for a PDD change of zone. It was clarified that enriched nitrogen groundwater irrigation would not occur during rain events or as a matter of routine. Irrigation using the nitrogen enriched groundwater would be a supplement to fertilization and included under the 2.5 lbs/1000 SF maximum, applied through a carefully controlled Integrated Turf Health Management Plan (ITHMP) to maximize vegetative uptake. This would be regulated through real-time monitoring and mixing with a non-nitrogen enriched water source, resulting in soluble application that would be coordinated with ground application of fertilizers under the ITHMP. The Hills team indicated that technology is available to account for this under golf course management, and this would be subject to the ITHMP, change of zone approval, EIS findings, conditions, project design, site plan approval, golf course operations manual, Town oversight, reporting and monitoring. A.M. Petrovic confirmed that mechanisms for fertilizer application controls are being implemented on other golf courses in the Town and also mentioned that many of the specific turf management details would be determined during final design with the preparation of an Operations Manual, which will further refine the ITHMP and which will be subject to his review and approval. R. White confirmed that he will work with A.M. Petrovic to prepare SEQRA decision documents that reflect the findings of the analysis and conditions to ensure that the operational commitments are implemented. C. Gobler inquired if it was possible to track soluble nitrogen versus other applied nitrogen, either to determine benefit of nitrogen withdrawn from the aquifer or other tracking, to which A.M. Petrovic indicated this would not be possible and the participants concurred. There was discussion of whether this was needed or of value considering the controlled application and tracking of applied nitrogen, and monitoring of lysimeters and groundwater wells. C. Voorhis indicated that metering of the withdrawal well and monitoring of the withdrawal concentration would provide sufficient information to track nitrogen removed from the aquifer. C.

Gobler inquired about the leaching rate for soluble nitrogen applied as fertigation. A.M. Petrovic indicated that a leaching rate of 10% is realistic and the 20% leaching rate is conservative as discussed in relation to overall golf course turf leaching. C. Gobler noted that, to his knowledge, A.M. Petrovic has never been involved in a golf course using groundwater-based fertigation on Long Island or elsewhere.

Under Item III.D., C. Voorhis discussed the incorporation of a sewage treatment plant (STP) into the project design to further reduce nitrogen. The STP will employ the Baswood process which will achieve less than 10 mg/l of total nitrogen in effluent. This was described as a tertiary treatment system using a modified tricking filter with fixed film membrane process which C. Gobler acknowledged. C. Voorhis indicated that the system has been used for Discovery Land Company (DLC) projects in upstate New York and Mexico, and is ideal for the intermittent flow that occurs at a seasonal resort through use of multiple trains brought on-line depending on flow. The system will be reviewed and approved by SCDHS and C. Voorhis has attended preliminary meetings with SCDHS. This was noted by R. Grover as an important contribution encouraged by C. Gobler for water quality protection.

Item IV. involved a review of methodology for the nitrogen budget analyses of The Hills PDD, the Existing Condition, and the Existing Zoning alternatives using the SONIR model and LINAP assumptions. The nitrogen load calculations for wastewater, pet waste, fertilization and atmospheric deposition were reviewed, and the methodology was generally agreed to as being consistent with sound scientific practice. C. Voorhis noted that the hydrologic consulting firm LBG provided comments on behalf of the Group for the East End as part of the DEIS review. LBG simulated the SONIR model and provided minor comments on calculations which did not appreciably change the results. Overall, the LBG oversight was agreed to help in validating the SONIR model and methodologies for nitrogen budget calculations. C. Voorhis noted that this information will be included in the Final EIS.

As a result, there was discussion among the participants on the following items addressed in Items I.-IV of the meeting outline:

- Prior minutes; subject to minor input from A.M. Petrovic
- Methodology; basic mass calculations for Nitrogen, based on LINAP assumptions
- SONIR model preliminary results; generally acceptable based on the assumptions outlined subject to further review and confirmation

Item V.A. involved a review of preliminary findings of the updated SONIR analysis based on the discussions relating to assumptions and methodology. Those results are noted below and in the attached presentation **(Attachment A)**:

| | |
|---|---|
| The Hills PDD | 1,802.45 lbs/year |
| Fertigation (mitigation) | 1,876.41 lbs/year |
| | - 73.96 lbs/year |
| Existing Conditions | 1,011.22 lbs/year |
| Existing Zoning | 5,582.89 lbs/year |

C. Gobler recognized that this is based on the SONIR model calculations which he has not reviewed in depth and therefore is not in a position to fully agree with the analyses. Other participants were generally in agreement that the analysis is accurate based on the assumptions

and methodology discussed in Items II.-IV and presented as shown in **Attachment A**. Under Item V.B., C. Voorhis and R. Grover noted that additional off-site mitigation would be provided based on the applicants commitment to donate $1,000,000 for septic system upgrades and to explore providing wastewater treatment for the East Quogue Elementary School subject to their participation. P. Grosser noted that preliminary calculations of off-site benefits were done that would be updated based on agreed assumptions and methodologies. The participants noted that there would be additional quantifiable benefit resulting in additional reduction in nitrogen to ensure that the project is net negative in terms of nitrogen load.

C. Gobler raised a few items that were discussed in greater depth noted as follows:

1. 10 mg/l in withdrawal/fertigation well may be optimistic. (There was discussion that the SCWA data supports 10+ mg/l given the 6-year data for concentration and pumping of Spinney Road Well #2.)
2. Potential I/A OWTS for new construction. (There was discussion that this is not law but draft legislation by SCDHS. The status of the sanitary code update will be determined.)
3. Seasonal occupancy of Existing Zoning alternative. (There was discussion that there would be no covenant restricting occupancy for development under Existing Zoning. C. Voorhis indicated that this needed to be reconciled with the contrasting condition that the PDD would have a covenanted occupancy restriction. C. Voorhis indicated that he previously reviewed census data in consideration of a seasonal factor. C. Gobler hypothetically offered that perhaps 50% of the homes would be occupied year-round and the remaining 50% would be occupied seasonally, to which C. Voorhis indicated that that was fairly close to what was supported by census data.)
4. Review fertilized area for Existing Zoning alternative. (C. Gobler indicated that he has prepared some nitrogen budget analyses that he offered to make available, that are coming up lower on fertilizer source nitrogen [as well as other source nitrogen as noted in 1-3. above]. C. Voorhis indicated that the DEIS included plans for the Existing Zoning PRD/cluster map and that the clearing limits and fertilized vegetation limits that apply to the PDD were also applied to the Existing Zoning alternatives. C. Voorhis indicated that coverage quantities were prepared by the project design team, included in Table 5-1 of the DEIS, used in SONIR model and are believed be accurate. C. Voorhis will review and provide information to C. Gobler).[3]

It was determined that these items will be considered by the scientific team and addressed qualitatively or quantitatively with justification provided in the FEIS as appropriate.

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[3] Note: this was performed in a subsequent email after the meeting on March 17, 2017 from C. Voorhis to C. Gobler that included the following information: "On item #4 above, I checked on the question you had relating to the fertilizer dependent vegetation for the Existing Zoning PRD (cluster). The short answer is that your question was accounted for. The DEIS (Section 5) supports the conclusion that each of the two "per Existing Zoning" alternatives (#2a and 2b) that were included as plans in the DEIS would be near the 15% maximum allowed fertilized acreage. The maximum allowed is 15% fertilized acreage or 88.65 acres. The proposed project has 86.53 acres as we discussed. For Existing Zoning, the spreadsheet we discussed today has 81.66 fertilized area. The original plan from the DEIS has 80.26 acres of fertilized area reflected (within 1± acre). The other assumptions for natural, impervious, etc. are included in Table 5-1, Section 5.0 of the DEIS. We find that the acreage of turf for the Existing Zoning alternatives used for the DEIS and calculations in the attached presentation are realistic. Try matching these numbers, which we feel are the best estimate of a hypothetical development, with your analysis and see if it reconciles the difference of turf nitrogen load."

Under Items VI. and VII., C. Gobler noted that he will provide a comment letter on the DEIS, and will recognize that the LINAP assumptions that were discussed at this meeting have been evolving in recent months and have become available as public record since the Town acceptance of the DEIS. C. Gobler indicated that he will provide an epilogue to his DEIS comments that recognize the discussions held by the participants in the meetings of February 1 and March 17 as referenced in the minutes. The epilogue will acknowledge the use of the LINAP assumptions, incorporation of wastewater treatment into the project, use of a lower fertigation source well nitrogen concentration, updated nitrogen budget analyses, and items as discussed above and the minutes of the February 1, 2017 meeting.

These minutes are intended to accurately reflect the takeaway items from the meeting of March 17, 2017. The participants have reviewed and commented on the content and are in agreement. The meeting began at approximately 10:15 and ended at approximately 11:55 AM.

Summary of Next Steps:

1. Town of Southampton to provide A.M. Petrovic analysis of golf turf leaching rates to SCDHS and LINAP to inform the LINAP process of Southampton Golf Course case study information

2. Nitrogen budget analysis to be updated per the findings of these minutes and included in the Final EIS; specific parameters to be updated are as follows:

   - Modified turf leaching rate (subject to final decision on input value by Town)
   - Other LINAP assumptions for wastewater, pet waste and atmospheric deposition
   - Consideration of seasonal occupancy for Existing Zoning PRD (75% factor)
   - Lower concentration of nitrogen in fertigation withdrawal well (10 mg/l)

   Multiple scenarios for occupancy, leaching rates and fertigation well withdrawal concentration will be presented for sensitivity, with most likely scenarios noted

3. C. Gobler to provide his comments on the DEIS and an epilogue recognizing the nitrogen budget analysis updates reflected in these minutes; close of comments on the DEIS is April 1, 2017

4. C. Gobler to provide his nitrogen budget analysis (at his discretion) for review by the technical participants

5. Town of Southampton consultants A.M. Petrovic and R. White will review the Final EIS (with Town staff coordination) for accuracy and provide a recommendation to the Town Board as to the suitability of the document for acceptance. Once accepted, the Town consultants and staff will prepare a Statement of Findings on the EIS process for consideration by the Town Board. The Findings will form the basis for a decision on the project to be rendered by the Town Board. The Town Board of the Town of Southampton is lead agency and is responsible for the Final EIS and Statement of Findings.

# Attachment A

# Presentation for The Hills Water Resources Technical Meeting March 17, 2017

# The Hills at Southampton

## Water Resources/ Nitrogen Budget Analysis Presentation

March 17, 2017

# Outline

I. Overview
   A. Meeting Time Schedule
   B. Mention of Prior Meeting Minutes
II. Discussion of LINAP Assumptions
   A. Nitrogen Sources
   B. Leaching Rates
III. Discussion of Site Specific Assumptions
   A. Golf Course ITHMP
   B. Town Experience
   C. Fertigation/Technology/Concentration
   D. STP Technology
IV. Discussion of Methodology
   A. Nitrogen Load Calculations
   B. Updates
V. Discussion of Preliminary Findings
   A. On-Site
   B. Off-Site
VI. Summary/Consensus
VII. Next Steps/Minutes

# Outline Item I.

I. Overview

A. Meeting Time Schedule

B. Mention of Prior Meeting Minutes

# Outline Item II.

## II. Discussion of LINAP Assumptions

### A. Nitrogen Sources

### B. Leaching Rates

# Outline Item II. LINAP Assumptions

| | |
|---|---|
| Persons/dwelling | = 2.9 (Southampton Town) |
| Nitrogen/person/yer | = 10 lbs/year |
| Sanitary N Leaching rate | = 84% |
| Golf turf N leaching rate | = 20% |
| Residential turf N leaching rate | = 30% |
| Agricultural turf N leaching rate | = 40% |
| Residential N application rate | = 2.04 lbs/1000 SF |
| Golf course N application rate | = per Hills per ITHMP |
| Outdoor cat population | = 0.74 pets/dwelling |
| Cat waste nitrogen load | = 3.22 lbs/pet/year |
| Outdoor dog population | = 1.4 pets/dwelling |
| Dog waste nitrogen load | = 4.29 lbs/pet/year |
| Pet waste leaching rate | = 25% |
| Atmospheric deposition | = 0.041 lbs/1000 SF |
| AD LR (natural/wetlands) | = 25% |
| AD LR (turf) | = 30% |
| AD LR (agri, imperv, other) | = 40% |

# Outline Item III.

III. Discussion of Site Specific Assumptions

A. Golf Course ITHMP

B. Town Experience

C. Fertigation/Technology/Concentration

D. STP Technology

# Outline Item III. Site Specific Assumptions

A. Golf Course ITHMP

- Controlled application rates
- Meteorological data, soil monitoring
- 2.5 lbs/1000 SF (greens, tees, fairways)
- Strictly Managed (limitations through C&R/PDD)

# Outline Item III. Site Specific Assumptions

B. Town Experience

- A.M. Petrovic
- Sebonack Golf Course
- Golf at the Bridge Golf Course
- Other data analysis and findings

# Outline Item III. Site Specific Assumptions

C. Fertigation/Technology/Concentration

- Common technology
- PW Grosser GW Flow Modeling
- Included in Town WQIPP as a Method
- Considered for Georgica Pond Remediation
- SCWA Data 2010-2016 (Average N; 12.76 mg/l)

# Outline Item III. Site Specific Assumptions

D. STP Technology

Baswood System
Achieves 10 mg/l or less
Approved for Silo Ridge in NYS
In use at Cabos, Mexico; DLC project
Suitable for modular trains, intermittent flow
Met SCDHS; will be approved by SCDHS for Hills

# Outline Item III. Site Specific Assumptions

## The Hills Wastewater Generation (DEIS Table 1-14)

| Residential Component: | | | |
|---|---|---|---|
| Woodland Estate Lots | 26 units | 300 gpd/unit | 7,800 gpd |
| Village Estate Lots | 16 units | 300 gpd/unit | 4,800 gpd |
| Village Lots | 53 units | 300 gpd/unit | 15,900 gpd |
| Total Residential Component | | | 28,500 gpd |
| Golf Course Component: | | | |
| Club Condos | 24,000 SF (10 units) | 300 gpd/unit | 3,000 gpd |
| Clubhouse Facilities | 131,760 SF (2) | --- | 6,414 gpd |
| Club Cottages | 13 units | 300 gpd/unit | 3,900 gpd |
| Total Golf Course Component | | | 13,314 gpd |
| Total Sanitary Wastewater Generation | | | 41,814 gpd |

Notes: Includes employees for Clubhouse Facilities
Adjust for Seasonal Occupancy

# Outline Item IV.

## IV. Discussion of Methodology

A. Nitrogen Load Calculations

B. Updates

# N Load Calculations

# The Hills PDD

## SIMULATION OF NITROGEN IN RECHARGE (SONIR)

SHEET 3

NELSON, POPE & VOORHIS, LLC MICROCOMPUTER MODEL

PDD 118 resort homes plus golf; STP; 20% Turf LR; 60d

### SITE NITROGEN BUDGET

| A | Sanitary Nitrogen-Residential | Value | Units |
|---|---|---|---|
| 1 | Number of Dwellings | 0 | units |
| 2 | Persons per Dwelling | 2.90 | capita |
| 3 | P = Population | 0.00 | capita |
| 4 | N = Nitrogen per person | 10 | lbs |
| 6 | N = (total; pre loss/removal) | 0 | lbs |
| 7 | LR = Leaching Rate | 84% | percent |
| 8 | N(S) = P x N x LR | 0.00 | lbs |
| 9 | N = loss/removed | 0.00 | lbs |

| B' | Cat Waste Nitrogen | Value | Units |
|---|---|---|---|
| 1 | Number of Cats per Dwelling | 0.74 | cats/dwelling |
| 2 | Number of Cats (Cats/dwelling x dwellings) | 87 | cats |
| 3 | Cat Waste Nitrogen Load | 3.22 | lbs/cat/year |
| 4 | N(p) = AR x cats x Adjustment (if applicable) | 46.22 | lbs/year |
| 5 | LR = Leaching Rate | 25% | percent |
| 6 | N(P) = N(p) x LR | 11.55 | lbs |
| 7 | N = (loss/removed) | 34.66 | lbs |

| B' | Dog Waste Nitrogen | Value | Units |
|---|---|---|---|
| 1 | Number of Dogs per Dwelling | 1.40 | cats/dwelling |
| 2 | Number of Cats (Cats/dwelling x dwellings) | 165 | dogs |
| 3 | Dog Waste Nitrogen Load | 4.29 | lbs/cat/year |
| 4 | N(p) = AR x dogs x Adjustment (if applicable) | 116.50 | lbs/year |
| 5 | LR = Leaching Rate | 25% | percent |
| 6 | N(P) = N(p) x LR | 29.12 | lbs |
| 7 | N = (loss/removed) | 87.37 | lbs |

| C | Sanitary Nitrogen (Wastewater Design Flow) | | |
|---|---|---|---|
| 1 | CF = Commercial/STP Flow | 6,874 | gal/day |
| 2 | CF = Commercial/STP Flow | 9,495,959 | liters/yr |
| 3 | N = Nitrogen (1) | 10.00 | mg/l |
| 4 | N = Nitrogen (1) | 209.39 | lbs |
| 5 | N = Nitrogen (2) | 10.00 | mg/l |
| 6 | N = Nitrogen (2) | 209.39 | lbs |
| 7 | LR = Leaching Rate | 90% | percent |
| 8 | N(S) = CF x N x LR | 85,463,635 | milligrams |
| 9 | N(S) = Sanitary Nitrogen | 188.45 | lbs |
| 10 | N = loss/removed | 20.94 | lbs |

| D | Water Supply Nitrogen (other than wastewater, if applicable) | | |
|---|---|---|---|
| 1 | WDF = Wastewater Design Flow | 0 | gal/day |
| 2 | WDF = Wastewater Design Flow | 0 | liters/yr |
| 3 | N = Nitrogen in Water Supply | 60.00 | mg/l |
| 4 | N(WW) = WDF x N | 0 | milligrams |
| 5 | N(WW) = Wastewater Nitrogen | 0.00 | lbs |

| E | Fertilized Land (Golf Rough/Res/Golf Landscaped) | | |
|---|---|---|---|
| 1 | A = Area of Land Fertilized 1 | 2,059,952 | sq ft |
| 2 | AR = Application Rate | 1.00 | lbs/1000 sf |
| 3 | N(T) = Nitrogen (total applied) | 2059.95 | lbs |
| 4 | LR = Leaching Rate | 20% | percent |
| 5 | N(F1) = A x AR x LR | 411.99 | lbs |
| 6 | N = loss/removed | 1647.96 | lbs |

| F | Fertilized Land (Greens/Tees/Fairways) | | |
|---|---|---|---|
| 1 | A = Area of Land Fertilized 2 | 1,796,414 | sq ft |
| 2 | AR = Application Rate | 2.50 | lbs/1000 sf |
| 3 | N(T) = Nitrogen (total applied) | 4491.04 | lbs |
| 4 | LR = Leaching Rate | 20% | percent |
| 5 | N(F2) = A x AR x LR | 898.21 | lbs |
| 6 | N = loss/removed | 3592.83 | lbs |

| G | Atmospheric Nitrogen (existing condition) | | |
|---|---|---|---|
| 1 | Application Load | 0.041 | lbs/1000 sf |
| 2 | Area of Natural/Wetlands/1000 sf | 20,725 | 1000 sf |
| 3 | Leaching Rate | 25% | percent |
| 4 | Atmos. N Load-1 (natural/wetlands) | 212.43 | lbs/year |
| 5 | Area of turf/golf/1000 sf | 3,856 | 1000 sf |
| 6 | Leaching Rate | 20% | percent |
| 7 | Atmos. N Load-2 (golf/turf) | 31.62 | lbs/year |
| 8 | Area of Impervious/Agricult/1000 sf | 1,163 | 1000 sf |
| 9 | Leaching Rate | 40% | percent |
| 10 | Atmos. N Load-3 (ag; imperv; other) | 19.07 | lbs/year |
| 11 | N(at) = N Load 1 + 2 + 3 | 263.12 | lbs |
| 12 | N = loss/removed | 792.38 | lbs |

| H | Irrigation Nitrogen | | |
|---|---|---|---|
| 1 | R = Irrigation Recharge (inches) | 0.00 | inches |
| 2 | R = Irrigation Rate (feet) | 0.0001 | feet |
| 3 | A = Area of Land Irrigated | 932,376 | sq ft |
| 4 | R(I) = R(irr) x A | 51 | cu ft |
| 5 | R(I) = Site Irrigation (liters) | 1,450 | liters |
| 6 | N = Nitrogen in Water Supply | 2.00 | mg/l |
| 7 | N(T) = Nitrogen (total applied) | 0.01 | lbs |
| 8 | LR = Leaching Rate | 10% | percent |
| 9 | N(irr) = R(I) x N x LR | 290 | milligrams |
| 10 | N(irr) = Irrigation Nitrogen | 0.00 | lbs |
| 11 | N = loss/removed | 0.01 | lbs |

| Total Site Nitrogen | | |
|---|---|---|
| N= | N(S) + N(P) + N(WW) + N(F1) + N(F2) + N(ppt) + N(irr) | |
| N= | **1,802.45** | lbs |

# N Load Calculations

# Existing Conditions

## SIMULATION OF NITROGEN IN RECHARGE (SONIR)

SHEET 3

NELSON, POPE & VOORHIS, LLC MICROCOMPUTER MODEL

Existing Conditions; No Action

### SITE NITROGEN BUDGET

| A | Sanitary Nitrogen-Residential | Value | Units |
|---|---|---|---|
| 1 | Number of Dwellings | 0 | units |
| 2 | Persons per Dwelling | 2.90 | capita |
| 3 | P = Population | 0.00 | capita |
| 4 | N = Nitrogen per person | 10 | lbs |
| 6 | N = (total; pre loss/removal) | 0 | lbs |
| 7 | LR = Leaching Rate | 84% | percent |
| 8 | N(S) = P x N x LR | 0.00 | lbs |
| 9 | N = loss/removed | 0.00 | lbs |

| C | Sanitary Nitrogen (Wastewater Design Flow) | | |
|---|---|---|---|
| 1 | CF = Commercial/STP Flow | 0 | gal/day |
| 2 | CF = Commercial/STP Flow | 0 | liters/yr |
| 3 | N = Nitrogen (1) | 60.00 | mg/l |
| 4 | N = Nitrogen (1) | 0.00 | lbs |
| 5 | N = Nitrogen (2) | 60.00 | mg/l |
| 6 | N = Nitrogen (2) | 0.00 | lbs |
| 7 | LR = Leaching Rate | 84% | percent |
| 8 | N(S) = CF x N x LR | 0 | milligrams |
| 9 | N(S) = Sanitary Nitrogen | 0.00 | lbs |
| 10 | N = loss/removed | 0.00 | lbs |

| E | Fertilized Land (Parlato) | | |
|---|---|---|---|
| 1 | A = Area of Land Fertilized 1 | 687,377 | sq ft |
| 2 | AR = Application Rate | 2.53 | lbs/1000 sf |
| 3 | N(T) = Nitrogen (total applied) | 1739.06 | lbs |
| 4 | LR = Leaching Rate | 40% | percent |
| 5 | N(F1) = A x AR x LR | 695.63 | lbs |
| 6 | N = loss/removed | 1043.44 | lbs |

| G | Atmospheric Nitrogen (existing condition) | | |
|---|---|---|---|
| 1 | Application Load | 0.041 | lbs/1000 sf |
| 2 | Area of Natural/Wetlands/1000 sf | 23,984 | 1000 sf |
| 3 | Leaching Rate | 25% | percent |
| 4 | Atmos. N Load-1 (natural/wetlands) | 245.84 | lbs/year |
| 5 | Area of turf/golf/1000 sf | 802 | 1000 sf |
| 6 | Leaching Rate | 30% | percent |
| 7 | Atmos. N Load-2 (turf) | 9.87 | lbs/year |
| 8 | Area of Impervious/Agricult/1000 sf | 957 | 1000 sf |
| 9 | Leaching Rate | 40% | percent |
| 10 | Atmos. N Load-3 (ag; imperv; other) | 15.70 | lbs/year |
| 11 | N(at) = N Load 1 + 2 +3 | 271.41 | lbs |
| 12 | N = loss/removed | 784.09 | lbs |

| B' | Cat Waste Nitrogen | Value | Units |
|---|---|---|---|
| 1 | Number of Cats per Dwelling | 0.74 | cats/dwelling |
| 2 | Number of Cats (Cats/dwelling x dwellings) | 0 | cats |
| 3 | Cat Waste Nitrogen Load | 3.22 | lbs/cat/year |
| 4 | N(p) = AR x cats x Adjustment (if applicable) | 0.00 | lbs/year |
| 5 | LR = Leaching Rate | 25% | percent |
| 6 | N(P) = N(p) x LR | 0.00 | lbs |
| 7 | N = (loss/removed) | 0.00 | lbs |

| B' | Dog Waste Nitrogen | Value | Units |
|---|---|---|---|
| 1 | Number of Dogs per Dwelling | 1.40 | cats/dwelling |
| 2 | Number of Cats (Cats/dwelling x dwellings) | 0 | dogs |
| 3 | Dog Waste Nitrogen Load | 4.29 | lbs/cat/year |
| 4 | N(p) = AR x dogs x Adjustment (if applicable) | 0.00 | lbs/year |
| 5 | LR = Leaching Rate | 25% | percent |
| 6 | N(P) = N(p) x LR | 0.00 | lbs |
| 7 | N = (loss/removed) | 0.00 | lbs |

| D | Water Supply Nitrogen (other than wastewater, if applicable) | | |
|---|---|---|---|
| 1 | WDF = Wastewater Design Flow | 0 | gal/day |
| 2 | WDF = Wastewater Design Flow | 0 | liters/yr |
| 3 | N = Nitrogen in Water Supply | 20.89 | mg/l |
| 4 | N(WW) = WDF x N | 0 | milligrams |
| 5 | N(WW) = Wastewater Nitrogen | 0.00 | lbs |

| F | Fertilized Land (Kracke) | | |
|---|---|---|---|
| 1 | A = Area of Land Fertilized 2 | 43,560 | sq ft |
| 2 | AR = Application Rate | 2.53 | lbs/1000 sf |
| 3 | N(T) = Nitrogen (total applied) | 110.21 | lbs |
| 4 | LR = Leaching Rate | 40% | percent |
| 5 | N(F2) = A x AR x LR | 44.08 | lbs |
| 6 | N = loss/removed | 66.12 | lbs |

| H | Irrigation Nitrogen | | |
|---|---|---|---|
| 1 | R = Irrigation Recharge (inches) | 0.00 | inches |
| 2 | R = Irrigation Rate (feet) | 0.00 | feet |
| 3 | A = Area of Land Irrigated | 60,984 | sq ft |
| 4 | R(I) = R(irr) x A | 0 | cu ft |
| 5 | R(I) = Site Precipitation (liters) | 0 | liters |
| 6 | N = Nitrogen in Water Supply | 2.00 | mg/l |
| 7 | N(T) = Nitrogen (total applied) | 0.00 | lbs |
| 8 | LR = Leaching Rate | 10% | percent |
| 9 | N(irr) = R(I) x N x LR | 0 | milligrams |
| 10 | N(irr) = Irrigation Nitrogen | 0.00 | lbs |
| 11 | N = loss/removed | 0.00 | lbs |

| Total Site Nitrogen | | |
|---|---|---|
| N= | N(S) + N(P) + N(WW) + N(F1) + N(F2) + N(ppt) + N(irr) | |
| N= | 1,011.12 | lbs |

# N Load Calculations

# Existing Zoning

## SIMULATION OF NITROGEN IN RECHARGE (SONIR)

SHEET 3

NELSON, POPE & VOORHIS, LLC MICROCOMPUTER MODEL

Alternative 2a; Existing Zoning PRD; no STP; 30% LR

SITE NITROGEN BUDGET

| A | Sanitary Nitrogen-Residential | Value | Units |
|---|---|---|---|
| 1 | Number of Dwellings | 118 | units |
| 2 | Persons per Dwelling | 2.90 | capita |
| 3 | P = Population | 342.20 | capita |
| 4 | N = Nitrogen per person | 10 | lbs |
| 6 | N = (total; pre loss/removal) | 3422 | lbs |
| 7 | LR = Leaching Rate | 84% | percent |
| 8 | N(S) = P x N x LR | 2874.48 | lbs |
| 9 | N = loss/removed | 547.52 | lbs |

| C | Sanitary Nitrogen (Wastewater Design Flow) | | |
|---|---|---|---|
| 1 | CF = Commercial/STP Flow | 0 | gal/day |
| 2 | CF = Commercial/STP Flow | 0 | liters/yr |
| 3 | N = Nitrogen (1) | 60.00 | mg/l |
| 4 | N = Nitrogen (1) | 0.00 | lbs |
| 5 | N = Nitrogen (2) | 60.00 | mg/l |
| 6 | N = Nitrogen (2) | 0.00 | lbs |
| 7 | LR = Leaching Rate | 84% | percent |
| 8 | N(S) = CF x N x LR | 0 | milligrams |
| 9 | N(S) = Sanitary Nitrogen | 0.00 | lbs |
| 10 | N = loss/removed | 0.00 | lbs |

| E | Fertilized Landscaping | | |
|---|---|---|---|
| 1 | A = Area of Land Fertilized 1 | 3,557,110 | sq ft |
| 2 | AR = Application Rate | 2.04 | lbs/1000 sf |
| 3 | N(T) = Nitrogen (total applied) | 7256.50 | lbs |
| 4 | LR = Leaching Rate | 30% | percent |
| 5 | N(F1) = A x AR x LR | 2176.95 | lbs |
| 6 | N = loss/removed | 5079.55 | lbs |

| G | Atmospheric Nitrogen (existing condition) | | |
|---|---|---|---|
| 1 | Application Load | 0.041 | lbs/1000 sf |
| 2 | Area of Natural/Wetlands/1000 sf | 20,102 | 1000 sf |
| 3 | Leaching Rate | 25% | percent |
| 4 | Atmos. N Load-1 (natural/wetlands) | 206.05 | lbs/year |
| 5 | Area of turf/golf/1000 sf | 3,557 | 1000 sf |
| 6 | Leaching Rate | 30% | percent |
| 7 | Atmos. N Load-2 (turf) | 43.75 | lbs/year |
| 8 | Area of Impervious/Agricult/1000 sf | 2,085 | 1000 sf |
| 9 | Leaching Rate | 40% | percent |
| 10 | Atmos. N Load-3 (ag; imperv; other) | 34.19 | lbs/year |
| 11 | N(at) = N Load 1 + 2 + 3 | 283.99 | lbs |
| 12 | N = loss/removed | 771.51 | lbs |

| B' | Cat Waste Nitrogen | Value | Units |
|---|---|---|---|
| 1 | Number of Cats per Dwelling | 0.74 | cats/dwelling |
| 2 | Number of Cats (Cats/dwelling x dwellings) | 87 | cats |
| 3 | Cat Waste Nitrogen Load | 3.22 | lbs/cat/year |
| 4 | N(p) = AR x cats x Adjustment (if applicable) | 281.17 | lbs/year |
| 5 | LR = Leaching Rate | 25% | percent |
| 6 | N(P) = N(p) x LR | 70.29 | lbs |
| 7 | N = (loss/removed) | 210.88 | lbs |

| B' | Dog Waste Nitrogen | Value | Units |
|---|---|---|---|
| 1 | Number of Dogs per Dwelling | 1.40 | cats/dwelling |
| 2 | Number of Cats (Cats/dwelling x dwellings) | 165 | dogs |
| 3 | Dog Waste Nitrogen Load | 4.29 | lbs/cat/year |
| 4 | N(p) = AR x dogs x Adjustment (if applicable) | 708.71 | lbs/year |
| 5 | LR = Leaching Rate | 25% | percent |
| 6 | N(P) = N(p) x LR | 177.18 | lbs |
| 7 | N = (loss/removed) | 531.53 | lbs |

| D | Water Supply Nitrogen (other than wastewater, if applicable) | | |
|---|---|---|---|
| 1 | WDF = Wastewater Design Flow | 0 | gal/day |
| 2 | WDF = Wastewater Design Flow | 0 | liters/yr |
| 3 | N = Nitrogen in Water Supply | 2.00 | mg/l |
| 4 | N(WW) = WDF x N | 0 | milligrams |
| 5 | N(WW) = Wastewater Nitrogen | 0.00 | lbs |

| F | Unfertilized Landscape | | |
|---|---|---|---|
| 1 | A = Area of Land Fertilized 2 | 0 | sq ft |
| 2 | AR = Application Rate | 0.00 | lbs/1000 sf |
| 3 | N(T) = Nitrogen (total applied) | 0.00 | lbs |
| 4 | LR = Leaching Rate | 30% | percent |
| 5 | N(F2) = A x AR x LR | 0.00 | lbs |
| 6 | N = loss/removed | 0.00 | lbs |

| H | Irrigation Nitrogen | | |
|---|---|---|---|
| 1 | R = Irrigation Recharge (inches) | 0.43 | inches |
| 2 | R = Irrigation Rate (feet) | 0.04 | feet |
| 3 | A = Area of Land Irrigated | 60,984 | sq ft |
| 4 | R(I) = R(irr) x A | 0 | cu ft |
| 5 | R(I) = Site Precipitation (liters) | 0 | liters |
| 6 | N = Nitrogen in Water Supply | 24.00 | mg/l |
| 7 | N(T) = Nitrogen (total applied) | 0.00 | lbs |
| 8 | LR = Leaching Rate | 30% | percent |
| 9 | N(irr) = R(I) x N x LR | 0 | milligrams |
| 10 | N(irr) = Irrigation Nitrogen | 0.00 | lbs |
| 11 | N = loss/removed | 0.00 | lbs |

| Total Site Nitrogen | | |
|---|---|---|
| N= | N(S) + N(P) + N(WW) + N(F1) + N(F2) + N(ppt) + N(irr) | |
| N= | 5,582.89 | lbs |

# Outline Item V.

V. Discussion of Preliminary Findings

A. On-Site

B. Off-Site

# Outline Item IV. Preliminary Results

On-Site

- The Hills PDD 1,802.45 lbs/year
  Fertigation (mitigation) 1,876.41 lbs/year
  - 73.96 lbs/year
- Existing Conditions 1,011.22 lbs/year
- Existing Zoning 5,582.89 lbs/year

# Outline Item IV. Preliminary Results

Off-Site

- $1,000,000 in septic system upgrades
- Wastewater treatment for East Quogue School

Quantify N load reduction using same methodology

Increases net Nitrogen Negative

# Outline Item VI.

## VI. Summary/Consensus

## Questions/Discussion

# Outline Item VII.

## VII. Next Steps

## Consensus/FEIS

# Thank you all for your time!!

# Attachment B

# Review of LINAP and SCDHS Golf Course Nitrogen Leaching Rate Analysis

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March 27, 2017

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March 27, 2017

RE: Review of LINAP and SCDHS Golf Course Nitrogen leaching rate analysis

Based on the SCDHS Golf Course Leaching file (002) sent to me, the following is my review of their analysis on nitrogen leaching from golf courses (The Bridge example):

1. Assumptions: 15 year average increase in nitrogen concentration in groundwater is 1.5 mg/L

   Comment: The actual 15 yr average nitrogen concentration on turf response wells is 1.24 mg/L and the ambient wells 15 yr average is 0.15mg/L. One can not only use the values from the 4 turf response wells since the other 2 ambient wells are on the area that is fertilized. Therefore, averaging in both turf response and ambient wells the actual golf course wide average nitrogen concentration is 0.88 mg/L. Furthermore, when considering any leaching rate analysis, background levels need to be subtracted. Thus, the actual increase in nitrogen concentration was 0.78 mg/L (0.88-0.15).

2. Assumption: nitrogen application rate based on 2015 data of 1645 lbs applied to 70 acres

   Comment: the nitrogen application rate over the 15 years at The Bridge ranged from a low of 1645 lbs in 2015 to a high of 8667 lbs in 2004 (see table below). The 15 year yearly average application rate is 3241 lbs.

3. Golf Course Nitrogen Leaching Rate: Based on the assumption of rainfall, amount of irrigation, 50% evapotranspiration rate, increase in nitrogen concentration in groundwater and nitrogen application rate, the estimated nitrogen leaching rate was 24%.

   Comment: Using the 2 adjustments shown above of net increase concentration of 0.78 mg/L and average application rate of 3241 lbs, the nitrogen leaching rate is estimated to be 6.3%.

4. Application rate not related to concentration of nitrogen in groundwater

   Using the table below and the monitoring well data show in the15 yr graph below, it is easy to see there is no relationship between nitrogen applied and concentration of nitrogen in groundwater monitoring wells. Leaching of applied nitrogen has been shown in several studies not to be a linear relationship. Below is a graph that clearly illustrates this concept. Nitrogen leaching from turfgrass sites is affected by: source of nitrogen, rate

of application (especially soluble sources), season, irrigation and soils. There can be a much more rigorous evaluation of golf course on eastern Long Island and nitrogen fertilization than was presented here.

Table 1. Yearly total fertilizer nitrogen applications for The Bridge golf course (2001-2015)

| Year* | Pounds of Fertilizer Nitrogen Applied# |
|---|---|
| 2001 | 4971 |
| 2002 | 4971 |
| 2003 | 4387 |
| 2004 | 8667 |
| 2005 | 3172 |
| 2006 | 3270 |
| 2007 | 3215 |
| 2008 | 2513 |
| 2009 | 2073 |
| 2010 | 1961 |
| 2011 | 1935 |
| 2012 | 1767 |
| 2013 | 1839 |
| 2014 | 2226 |
| 2015 | 1645 |
| (2016 | 2572) |

*2001-2004, George Tiska was superintendent. 2005-present, Gregg Stanley is superintendent. # 2001- 2010 the amount of nitrogen fertilizer allowed to be applied was 6386 to 11,627 lbs/year and for 2011-present it is now 3000 lbs per year.

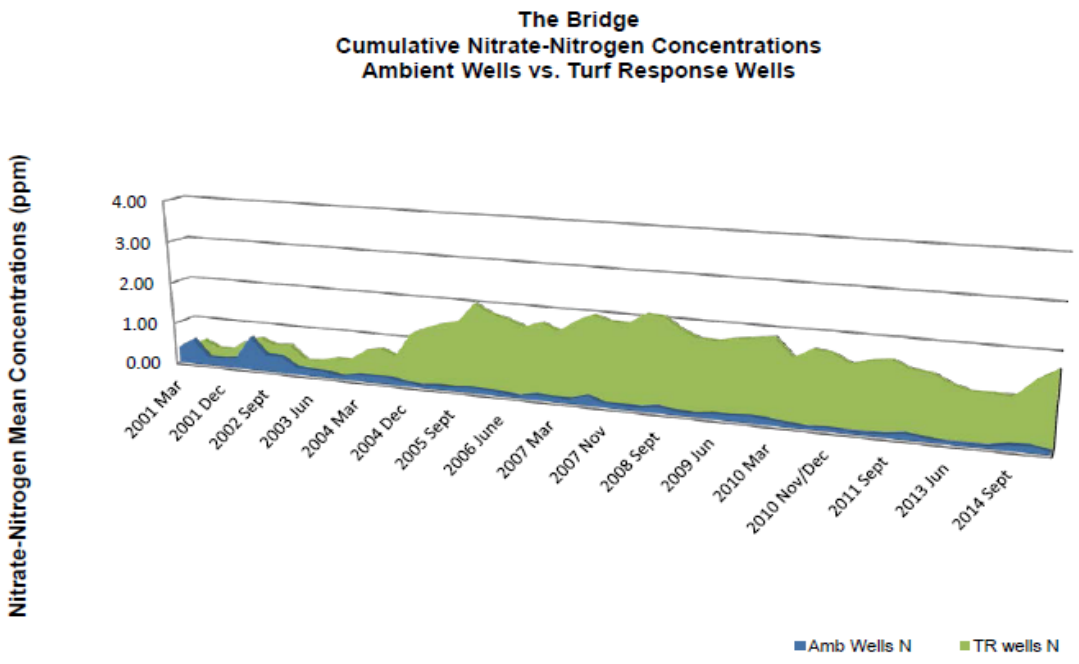
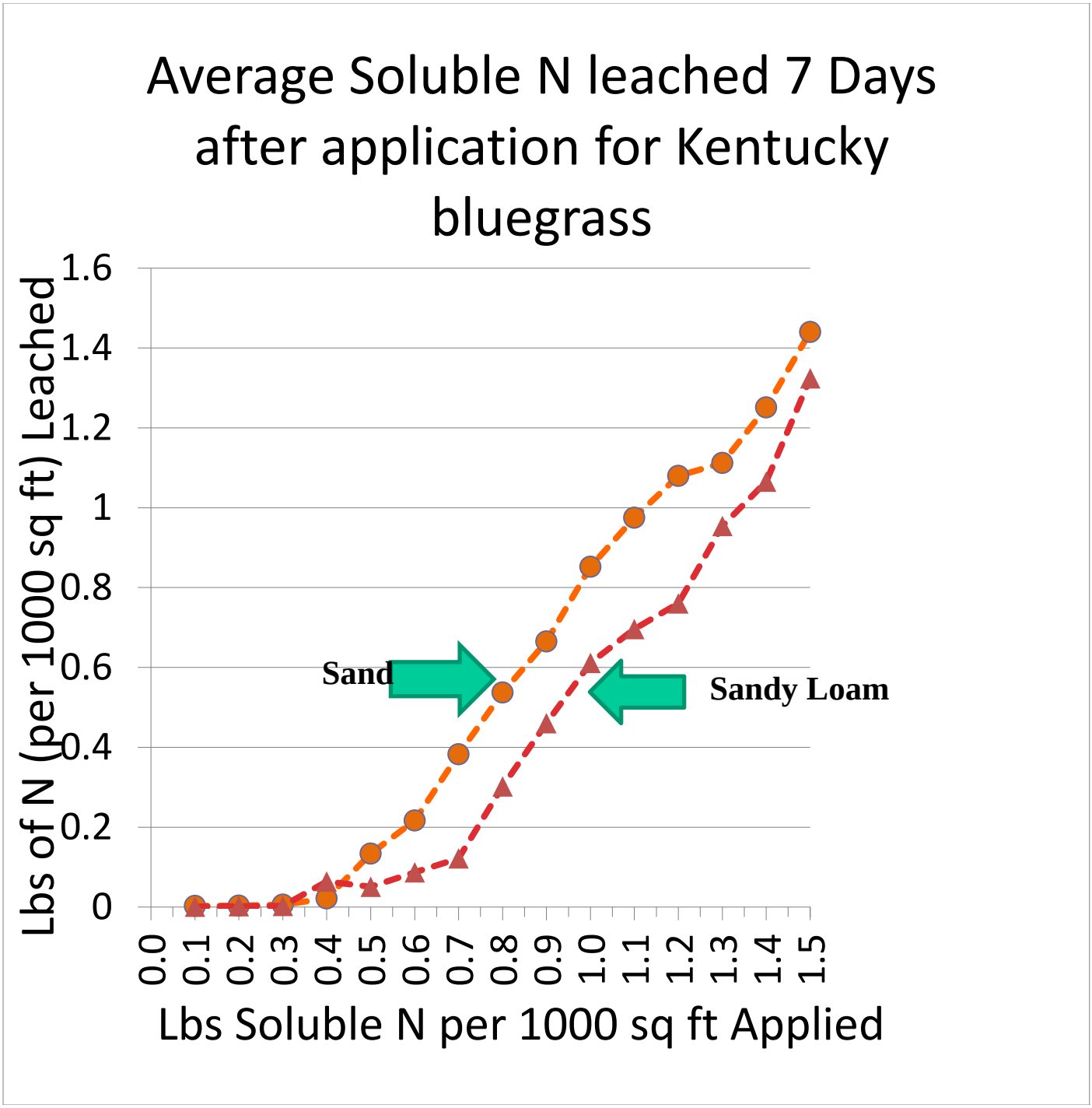



Figure 3. Combined Average Nitrate-Nitrogen Concentrations


Average Soluble N leached 7 Days after application for Kentucky bluegrass
Lbs of N (per 1000 sq ft) Leached
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Sand
Sandy Loam
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
Lbs Soluble N per 1000 sq ft Applied